

CLAIMS

What is claimed is:

5 1. A hearing aid comprising:

 a hearing aid case configured to be worn behind the
ear by a person;

 a first microphone fixed to the hearing aid case and
exposed to sound originating in free air and sound
10 propagating through the hearing aid case;

 a tube coupled to a second microphone and disposable
at an outer portion of the ear;

 a second microphone fixed to the hearing aid case
and sealed from sound propagating through air and exposed
15 to sound propagating through the tube;

 subtractive circuitry operative to receive
electrical outputs from the first microphone and the
second microphone and to subtract one of the electrical
outputs from the other of the electrical outputs to
20 produce a resulting electrical signal in which audio
signals which are propagated thorough the tube are
minimized and audio signals received through the air are
passed; and

 a transducer element operative to change the
25 resulting electrical signal into an audio signal.

2. The hearing aid of claim 1, wherein the first microphone and the second microphone have substantially the same audio to electrical conversion characteristics.
- 5 3. The hearing aid of claim 1, wherein the subtractive circuitry comprises a signal processor.
4. The hearing aid of claim 1, wherein the subtractive circuitry comprises a digital signal processor.
- 10 5. The hearing aid of claim 4, wherein the digital signal processor is operative to produce at least one audio test signal out of the transducer element.
- 15 6. The hearing aid of claim 5, wherein the digital signal processor is operative to use the audio test signal to adjust the electrical gain and phase of the second microphone with respect to the first microphone to minimize the audio signals propagated through the case of
- 20 the hearing aid from appearing in the resulting electrical signal.
7. The subtractive circuit of claim 1, wherein the gain and phase of the audio signal from one microphone can be

varied with respect to the second microphone to minimize the audio signals propagated through the tube from appearing in the resulting electrical signal.

5 8. The hearing aid of claim 1, wherein the second microphone is enclosed in a sealed enclosure within the hearing aid case and exposed to audio signals only through the tube.

10 9. The hearing aid of claim 8, wherein the sealed enclosure is fixed to the hearing aid case.

10. The hearing aid of claim 8, wherein the sealed enclosure is fixed to the subtractive circuitry.

15 11. The hearing aid of claim 1, wherein the distance between the first microphone and the second microphone is minimized.

20 12. The hearing aid of claim 1, wherein the hearing aid case is configured to fit behind an ear of the person.

13. The hearing aid of claim 1, further comprising a power source in communication with the subtractive circuitry.
- 5 14. The hearing aid of claim 13, wherein the power source comprises a battery.
15. The hearing aid of claim 1, further comprising:
a third microphone fixed to the hearing aid case and
10 sealed from sound propagating in air and exposed to sound propagating through the hearing aid case;
wherein the subtractive circuitry is further operative to receive electrical outputs from the third microphone and to subtract one of the electrical outputs
15 from the other two of the electrical outputs to produce a resulting electrical signal in which audio signals which are propagated through the hearing aid case are minimized and audio signals received through the air are passed.
- 20 16. A hearing aid comprising:
a hearing aid case configured to be worn by a person;

a first microphone fixed to the hearing aid case and exposed to sound propagating through free air and sound propagating through the hearing aid case;

5 a second microphone fixed to the hearing aid case and sealed from sound propagating through air and exposed to sound propagating through the hearing aid case;

subtractive means for receiving electrical outputs from the first microphone and the second microphone and subtracting one of the electrical outputs from the other
10 of the electrical outputs to produce a resulting electrical signal representative of audio signals transmitted through air; and

a transducer element operative to change the resulting electrical signal into an audio signal.

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17. The hearing aid of claim 16, wherein the first microphone and the second microphone have substantially the same audio to electrical conversion characteristics.

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18. The hearing aid of claim 16, wherein the subtractive means comprises a digital signal processor.

19. The hearing aid of claim 18, wherein the digital signal processor is operative to produce at least one audio test signal out of the transducer element.
- 5 20. The hearing aid of claim 19, wherein the digital signal processor is operative to use the audio test signal to adjust an electrical gain and phase of one of the first microphone and the second microphone to minimize audio signals propagating through the hearing aid case from appearing in the resulting electrical signal.
- 10 21. The hearing aid of claim 16, wherein a gain and phase of an audio signal from one of the first microphone and the second microphone are variable with respect to another of the first microphone and the second microphone to minimize audio signals propagating through the hearing aid case from being present in the resulting electrical signal.
- 15 22. The hearing aid of claim 16, wherein the second microphone is enclosed in a sealed enclosure within the hearing aid case.
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23. The hearing aid of claim 22, wherein the sealed enclosure is fixed to the hearing aid case.
24. The hearing aid of claim 22, wherein the sealed enclosure is fixed to the subtractive circuitry.
25. The hearing aid of claim 16, wherein the second microphone is enclosed in a sealed enclosure fixed to an outside of the hearing aid case.
26. The hearing aid of claim 25, wherein the sealed enclosure is fixed to the subtractive circuitry.
27. The hearing aid of claim 16, wherein a distance between the first microphone and the second microphone is minimized.
28. The hearing aid of claim 16, wherein the hearing aid case is configured to fit behind an ear of the person.
29. The hearing aid of claim 16, further comprising a power source in communication with the subtractive means.

30. The hearing aid of claim 29, wherein the power source comprises a battery.